# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : CANON INC

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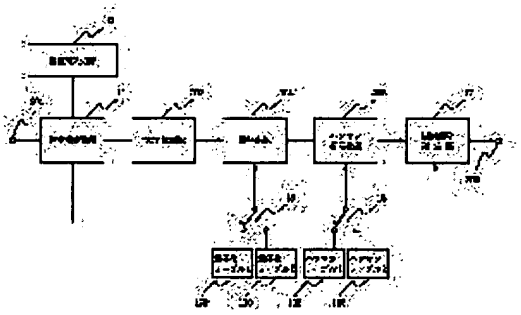
## (54) METHOD AND DEVICE FOR PROCESSING PICTURE

(57)Abstract:

PURPOSE: To reduce the load for data transfer by using a compression pattern corresponding to kinds of color spaces so as to enhance the compression efficiency.

CONSTITUTION: When picture data being data of an original are received by a compression section of a sender side, the color space of the data is converted into a color space suitable for that of a receiver side and suitable for compression transfer by a color space conversion section 11. The data are compressed and sent with a color space such as YUV or L*a*b* suitable for the device for each receiver side regardless of the color space of input picture data. Then an optimum parameter is selected from plural quantization tables 109, 110 and Huffman tables 105, 106 storing data corresponding to each color space is selected based on information from the color space conversion section 11 to compress data by the compression parameter. The picture data is quantized by a quantization section 304 by using the selected tables and applying Huffman coding to the data by a Huffman coding section 305. Since plural compression parameters are provided, the compression parameter is optimized in each color space and the compression efficiency is improved.



LEGAL STATUS

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| [Date of final disposal for application] | |
| [Patent number] | |
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| [Date of requesting appeal against examiner's decision of rejection] | |
| [Date of extinction of right] | |

* NOTICES *



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CLAIMS

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[Claim(s)]
[Claim 1] The image processing system characterized by having a compression means to compress this image data, using the compression parameter corresponding to the class of color space of image data.
[Claim 2] Furthermore, the image processing system according to claim 1 characterized by having a maintenance means to hold two or more sets of said compression parameter, and a selection means to choose the compression parameter suitable for said color space.
[Claim 3] Furthermore, the image processing system according to claim 1 characterized by having had a conversion means to change the color space of image data according to the device of a transmission place, and making a transfer possible by using the data of two or more color spaces as transfer data.
[Claim 4] The image processing system characterized by having a compression means to compress this image data, and a recognition signal generating means to generate the recognition signal which shows the class of said color space, using the compression parameter corresponding to the class of color space of image data.
[Claim 5] The image-processing approach characterized by having the pressing operation which compresses this image data using the compression parameter corresponding to the class of color space of image data.
[Claim 6] The image processing system characterized by having a selection means to choose the elongation parameter for image elongation, and an elongation means to elongate compression image data with this elongation parameter by the judgment result of the judgment means for judging the class of color space of the compression image data which received, and this judgment means.
[Claim 7] Furthermore, the image processing system according to claim 5 characterized by having a conversion means to change into a desired color space the image elongated from said elongation means.
[Claim 8] The image-processing approach characterized by having the selection process which chooses the elongation parameter for image elongation, and the elongation process which elongates compression image data with this elongation parameter by the judgment result of the judgment process for judging the class of color space of the compression image data which received, and this judgment process.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] The invention in this application relates to the image-processing approach and equipment which compress or elongate color picture data.
[0002]
[Description of the Prior Art] Conventionally, there is a base-line system of ADCT (Adaptive Discrete Cosine Transform) proposed by JPEG (Joint Photographic Experts Group) which is the international-standards method of color still picture coding as picture compression. The base-line system when using YUV as a color space is briefly explained using drawing 4 and drawing 5 below.
[0003] Drawing 4 shows the example of a configuration of a compression zone. The input terminal into which 301 inputs image data, the YUV transducer from which 302 changes the color space of input image data into a YUV color space, and 303 are the DCT processing section and an output terminal to which 304 outputs the image data into which the Huffman coding section and 306 were compressed into for the quantization section and 305, and the Huffman table and 308 were compressed for a quantization table and 307. In order to gather compression efficiency the way things stand since redundancy is between each color plane supposing input image data is inputted by RGB of NTSC from an input terminal 301, RGB data are changed into YUV data by the YUV transducer 302. The quantization table 306 used in the quantization section 304 at this time and the Huffman table 307 used in the Huffman coding section 305 are optimized according to the property which the data after YUV conversion show. The processing section which performs inverse transformation of this configuration is prepared for the elongation section. It is proposed by JPEG like the compression zone. The block diagram showing the elongation section is shown in drawing 5 .
[0004] The input terminal which inputs the image data into which 401 was compressed, and 402 are output terminals which output the image data by which the reverse quantization section and 404 were elongated for the Huffman decryption section and 403, and the YUV inverse transformation section and 408 were elongated for the IDCT processing section and 405.
[0005]
[Problem(s) to be Solved by the Invention] However, the conventional image-processing approach had the following faults.
[0006] In picture compression, a color space where an input performs a color space conversion to image data, and raises compressibility, and the error by conversion is not conspicuous was used. Two or more YUV, L*a*b*, XYZ(s), etc. exist, and what is generally known as a class of this color space may use a color space conversion still more original with that system for them. And in the system divided into a compression zone and the elongation section, only the data compressed on a certain regular color space are not necessarily transmitted. Although the standard color space had various things, such as L*a*b* and XYZ, besides above-mentioned YUV, conventionally, there is only the one [ of the YUV conversion ] processing section which performs color conversion to an elongation side, and the data compressed on the color space of L*a*b* or XYZ were not able to be received.

[0007] Moreover, although it should optimize to the data of the color space which compresses, since the parameter suitable for the color space of compression image data could not be used for the parameter used for compression processing of a quantization table, the Huffman table, etc. when the data on a different color space in a compression zone had been inputted, it had the fault that compression efficiency will fall.
[0008] Furthermore, conventionally, when two or more receiving sides which use a color space different, respectively existed, since the transmitting side treated only one kind of color space, compression image data was not able to be transmitted to the receiving side using color spaces other than the color space which can treat a transmitting side.
[0009] The invention in this application was made in view of the above-mentioned conventional example, and aims at offering the image-processing approach and equipment which can obtain high compression efficiency by using the compression parameter suitable for the color space of image data.
[0010] Moreover, the invention in this application aims at offering the image-processing approach and equipment which can choose the elongation parameter for which the elongation section transmitted in compression image data was suitable from the recognition signal.
[0011] Moreover, it aims at compressing in the color space suitable for a transmission place device.
[0012] Furthermore, the invention in this application aims at obtaining a good image by elongating with the elongation parameter suitable for the color space of compression image data.
[0013]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image processing system of this application claim 1 is characterized by having a compression means to compress this image data, using the compression parameter corresponding to the class of color space of image data.
[0014] The image processing system of this application claim 3 is characterized by having had a conversion means to change the color space of image data according to the device of a transmission place, and making a transfer possible by using the data of two or more color spaces as transfer data.
[0015] The image processing system of this application claim 4 is characterized by having a compression means to compress this input image data, and a recognition signal generating means to generate the recognition signal which shows the class of color space of this image data, using the compression parameter corresponding to the class of color space of image data.
[0016] The image processing system of this application claim 6 is characterized by having a selection means to choose the elongation parameter for image elongation, and an elongation means to elongate compression image data with this elongation parameter by the judgment result of the judgment means for judging the class of color space of the compression image data which received, and this judgment means.
[0017]
[Function] Since the compression parameter corresponding to the class of color space is used by the above configuration according to the image processing system of invention of this application claim 1, the loads concerning compression efficiency or rise data transfer are also reducible.
[0018] Moreover, according to the image processing system of invention of this application claim 3, it can compress and transmit in the color space suitable for a transmission place device.
[0019] Moreover, according to the image processing system of invention of this application claim 4, the elongation section of a transmission place device can judge the color space of compression image data from a recognition signal.
[0020] According to the image processing system of invention of this application claim 6, by carrying out the color space judging of the transmitted data, the elongation parameter suitable for the color space of a compression image can be chosen, and a good elongation image can be obtained.
[0021]
[Example] The conceptual diagram of drawing 1 and the elongation section of a receiving side is shown for the conceptual diagram of the compression zone of the transmitting side in the 1st example of the invention in this application in drawing 2 .
[0022] The hereafter same processing section as the compression zone ( drawing 4 ) of the conventional

example mentioned above attaches a same sign, and omits explanation. The color space input section which specifies the color space where 10 is performed by the color space conversion in drawing 1 , The color space conversion section from which 11 changes the color space of input image data into a desired color space, The quantization table suitable for the class of color space which 109 and 110 have a mutually different parameter and is different, respectively, The Huffman table suitable for the class of color space which 105 and 106 have a mutually different parameter and is different, respectively, the compression parameter (a quantization table --) suitable for the color space where 15 and 16 were changed based on the control signal from the color space conversion section 11 The switch which chooses the Huffman table, and 17 are the recognition signal generating sections for creating the recognition signal which shows the color space of the image data outputted based on the control signal from the color space conversion section 11 as a part of header information.

[0023] The quantization table contains the table for the table for brightness, a chromaticity, or the color difference on one table here.

[0024] Drawing 2 shows the elongation section 204 of a receiving side.

[0025] As for the switch which chooses the color space judging section which judges the color space of the image data compressed where 102 was inputted, and the inverse transformation section of the elongation parameter (the Huffman table, quantization table) for which 104, 108, and 112 were suitable based on the information on the color space of the judgment result of the color space judging section 102, and a color space, and 405, the YUV inverse transformation section and 409 are the L*a*b* inverse transformation sections.

[0026] It will be changed into the color space suitable for it having been suitable for the device of a receiving side, or compressing and transmitting in the color space conversion section 11, if the image data which shows a manuscript is inputted into the compression zone of the transmitting side shown in drawing 1 .

[0027] Therefore, it cannot be concerned with the color space of input image data, but can compress and transmit in color spaces, such as YUV suitable for the device of each receiving side, and L*a*b*.

[0028] Next, in order to compress the changed image data with the compression parameter suitable for the color space, based on the information from the color space conversion section 11, the compression parameter for which were most suitable is chosen from two or more quantization tables 109 and 110 corresponding to each color space currently held, and the Huffman tables 105 and 106. It quantizes in the quantization section 304 using the selected table, Huffman coding is carried out in the Huffman coding section 305, and image data is compressed.

[0029] Therefore, since a compression parameter is also as plurality, the loads which compression efficiency increases and are applied to data transfer are also reducible by the ability optimizing a compression parameter in each color space.

[0030] The recognition signal generating section 17 creates the signal which shows whether it compressed in which color space as a part of header information based on the information from the color space conversion section 11. Header information is transmitted from an output terminal 308 in advance of compression image information.

[0031] The compressed image data is inputted from the input terminal 401 of the elongation section of a receiving side shown in drawing 2 . At this time, the information which shows whether it is data compressed on which color space as header information is transmitted. This header information is transmitted in advance of image data like the image width and the image height which are information required for elongation. The color space judging section 102 determines the color space conversion in elongation processing based on the signal which shows the color space in a receipt and its information for the data of a color space from this header information. The color space judging section 102 sends a control signal to switches 104, 108, and 112 by the result of a color space judging, respectively.

[0032] For example, supposing the data on YUV space are transmitted now, the header information showing YUV space will be inputted into the color space judging section 102, and a control signal will be outputted so that switches 104 and 108 may choose the elongation parameter for YUV from here. The Huffman table optimized by each color space is stored in 105 and 106. The Huffman table 1 for YUV of

105 is chosen by the switch 104, and is inputted into the Huffman decryption section 402. In this Huffman decryption section 402, decryption processing is performed according to the inputted Huffman table 1. Moreover, the optimal quantization table for each color space is similarly stored in 109 and 110. The quantization table 1 for YUV of 109 is chosen by the switch 108, and is inputted into the reverse quantization section 403. In this reverse quantization section 403, reverse quantization processing is performed according to the inputted quantization table 1. IDCT conversion is performed in this IDCT processing section 404 after processing, and that result is outputted to a switch 112. Furthermore the control signal by the judgment result of the color space judging section 102 is inputted into a switch 112, and the processing section which performs a color space conversion is chosen. When the data of YUV space are inputted, the YUV inverse transformation section 405 is chosen by the switch 112. In the YUV inverse transformation section 405, inverse transformation is performed to data before compressing [ RGB ] from YUV data, and it is outputted to an output terminal 408.

[0033] Thus, when it is inputted by L*a*b* data on the other hand using the elongation parameter and color transducer which were optimized by the YUV space when a compression image was inputted by YUV data, it processes by choosing other elongation parameters and color transducers. That is, by judging a color space and choosing an elongation parameter from header information based on the judged color space, a compression parameter and the same parameter can be used and it can elongate good. In addition, while two or more compression parameters and color transducers are prepared so that it can respond to a compression zone and the elongation section in much more color spaces, and raising the degree of freedom of an input, compression efficiency can be gathered by using the compression parameter suitable for each.

[0034] (The 2nd example) Drawing showing the elongation section of the receiving side of the 2nd example of the invention in this application is shown in drawing 6 . Explanation is omitted about the block which carries out the same work as the elongation section of the 1st example.

[0035] This example is equipped with the device in which the compression parameter optimized to the data of two or more color spaces inputted is also transmitted in connection with image data, and they are stored.

[0036] In advance of the image data inputted from the input terminal 501, the compression parameter of two or more classes is loaded to a receiving side. The transmitted compression parameter is stored in the compression parameter storing section 505 in a receiving side. The information which shows the data on which color space it is as header information like an example 1 as for the compression image data inputted from the input terminal 501 is transmitted. The color space judging section 502 judges the image data on reception and which color space it is for the data of a color space from this header information. The judgment result is inputted into the compression parameter storing section 505, chooses the optimal compression parameter for the judged color space, and outputs it to the Huffman decryption section 503 and the reverse quantization section 504.

[0037] When it becomes unnecessary to hold a compression parameter beforehand and corresponds to many kinds of color space inputs by the configuration of this example, the hard amount for compression parameter maintenance can be reduced by loading only the compression parameter of a required color space to a receiving side.

[0038] (The 3rd example) Drawing showing the elongation section of the receiving side of the 3rd example of this invention is shown in drawing 7 . Explanation is omitted about the block which carries out the same work as the 2nd example.

[0039] In the system which transmits compression image data, this example is equipped only with the operation part, when color transform processing is realized by the primary matrix operation, and the matrix multiplier used for an operation is loaded from a transmitting side.

[0040] Like the 2nd example, in advance of image data, two or more compression parameters are loaded to a receiving side, and the matrix multiplier for performing color transform processing to coincidence is loaded. The loaded multiplier data are stored in the matrix multiplier storing section 605. The color space information judged in the color space judging section 602 is stored in this matrix multiplier storing section 605, the corresponding matrix multiplier is outputted to the matrix operation part 608,

and data processing for color conversion is performed by the matrix operation part 608.
[0041] Therefore, by communalizing the matrix operation part for performing color conversion, if it is a color space conversion by the primary matrix operation while simplifying a hard configuration, it will also become possible to use the color space of a system proper as input data besides the color space generally specified.
[0042] (The 4th example) The flow chart which shows the flow chart which shows the flow of processing of a compression zone 202 as the 4th example of this invention to drawing 8 , and shows the flow of the principle of the elongation section 204 is shown in drawing 9 .
[0043] At a compression zone 202, as shown in drawing 8 , image data is inputted at step 1. It is changed into the color space for transmitting at step 2. It is compressed with the compression parameter suitable for the color space changed at step 2 by step 3. Header information to show on which color space it was compressed at step 4 is created. Header information and the compressed image information are outputted at step 5.
[0044] On the other hand, in the elongation section 204, as shown in drawing 9 , the image data which was transmitted at step 6 and which is compressed is inputted. The color space of the image data compressed at step 7 is judged from header information.
[0045] The image data compressed using the elongation conditions for which it was suitable based on the color space judged at step 7 at step 8 is elongated. It changes into the color space which was suitable for the output device at step 9. The image data elongated at step 10 is outputted.
[0046] By performing the above processings on the software of a computer, the same effectiveness as other above-mentioned examples can be acquired.
[0047] (The 5th example) As the 5th example of this invention, the system which transmits image data to a printer 220 and a monitor 230 from a host computer 210 is shown in drawing 3 as an example of the system using the compression zone and the elongation section which were mentioned above.
[0048] The host computer with which 210 is equipped with the image file 201 and the compression zone 202 in drawing 3 , the image file where, as for 201, image data is saved, and 202 change the image data read from 201 into the color space suitable for the color space which transmits compression image data and which was suitable for devices, such as a printer and a monitor, for example, or transmission, and are a compression zone compressed using the compression parameter suitable for the color space after conversion from two or more compression parameters currently held. The elongation section changed into the color space which the printer by which 220 is equipped with the elongation section 204 and printer engine 205, and 204 chose the elongation parameter for which it was suitable from two or more elongation parameters from the color space of the image in the transmitted compression image, developed, and was further suitable for printer engine 205, and 205 are printer engine which carries out image formation based on the image data elongated from the elongation section 204. 230 is the monitor equipped with the elongation section 204 and the image display section 206. The elongation section changed into the color space which 204 compressed like the elongation section 204 of the printer 220 mentioned above, and was suitable for the image display section 206, and 206 are the image display sections which carry out image display based on the image data elongated from the elongation section 204. The transmission line where 203 connects a printer 220 to a host computer 210, and 204 are transmission lines which connect a monitor 230 to a host computer 210.
[0049] In the transmission lines 203 and 204 mentioned above by the above-mentioned configuration, in order to obtain higher-definition image data according to a device at the transmission place from which a host computer 210 differs, the color space of the request based on the properties and the various international standards of a transmission place device, such as a color space which a transmission place device uses, can be used.
[0050] And the loads which compression efficiency increases and are applied to data transfer since it is compressible with the compression parameter suitable for the color space are also reducible, and since two or more color spaces can be treated, the input degree of freedom between the transmitting side as a system and a receiving side can be raised.
[0051] Moreover, in the elongation section 204 of a receiving side, since the compression image of the

color space suitable for the property of a device is transmitted, a high-definition image is obtained.
[0052] In addition, before the property of transmission place devices which the transmission place device uses, such as a color space, compresses image data An exchange of a command is performed by the transmitting side which compresses, and the receiving side to elongate. When it compresses in the color space when the number of the color spaces which can treat an elongation side is one, and the color space of plurality [ side / elongation ] can be treated, the color space which compresses an image automatically is chosen so that it may compress in the color space suitable for the property of the device of a transmission place.
[0053] On the contrary, when a transmitting side can treat only one color space like the conventional example, the color space where the image is compressed in the color space judging section of the elongation section of a receiving side is judged, and it elongates with the elongation parameter suitable for the color space.
[0054] Moreover, in the above-mentioned example of the invention in this application, although the color space of YUV and L*a*b* is used in the color space conversion section of a compression zone, and the inverse transformation section of the elongation section, you may have the color space conversion section and the inverse transformation sections about a color space, such as YIQ, for example.
[0055] Moreover, neither the quantization tables 109 and 110 nor the Huffman tables 105 and 106 were limited each to two, but you may have them. [ many ]
[0056] Moreover, the system of the invention in this application may combine the devices (the interface between a computer and a printer, color FAX, etc.) not only treating the combination of a host computer 210, a printer 220, and a monitor 230 but other color pictures.
[0057] Moreover, in the above-mentioned example of the invention in this application, although based on ADCT of JPEG, if the compression parameter corresponding to the class of color space is used, it does not matter, for example in other coding of MPEG etc.
[0058]
[Effect of the Invention] As mentioned above, according to invention of this application claim 1, since the compression parameter corresponding to the class of color space is used, the loads concerning compression efficiency, or a rise and data transfer are also reducible.
[0059] Moreover, according to invention of this application claim 3, it can compress and transmit in the color space suitable for a transmission place device.
[0060] Moreover, according to invention of this application claim 4, the elongation section of a transmission place device can judge the color space of compression image data from a recognition signal.
[0061] According to invention of this application claim 6, by carrying out the color space judging of the transmitted data, the elongation parameter suitable for the color space of a compression image can be chosen, and a good elongation image can be obtained.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing an example of the compression zone of the transmitting side of the invention in this application.
[Drawing 2] It is the block diagram showing an example of the elongation section of the receiving side of the invention in this application.
[Drawing 3] It is drawing showing one example of the system of the invention in this application.
[Drawing 4] It is the block diagram showing an example of the compression zone of the conventional transmitting side.
[Drawing 5] It is the block diagram showing an example of the elongation section of the conventional receiving side.
[Drawing 6] It is the block diagram showing an example of the elongation section of the receiving side of the invention in this application in case a compression parameter is transmitted.
[Drawing 7] It is the block diagram showing an example of the elongation section of the receiving side of the invention in this application in the case of carrying out the primary matrix operation of the color transform processing.
[Drawing 8] It is drawing showing an example of the flow chart of the compression zone of the receiving side of the invention in this application.
[Drawing 9] It is drawing showing an example of the flow chart of the elongation section of the receiving side of the invention in this application.
[Description of Notations]
10 Color Space Input Section
11 Color Space Conversion Section
17 Recognition Signal Generating Section
301 Input Terminal
303 DCT Processing Section
304 Quantization Section
305 Huffman Coding Section
318 Output Terminal

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[Translation done.]

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DRAWINGS

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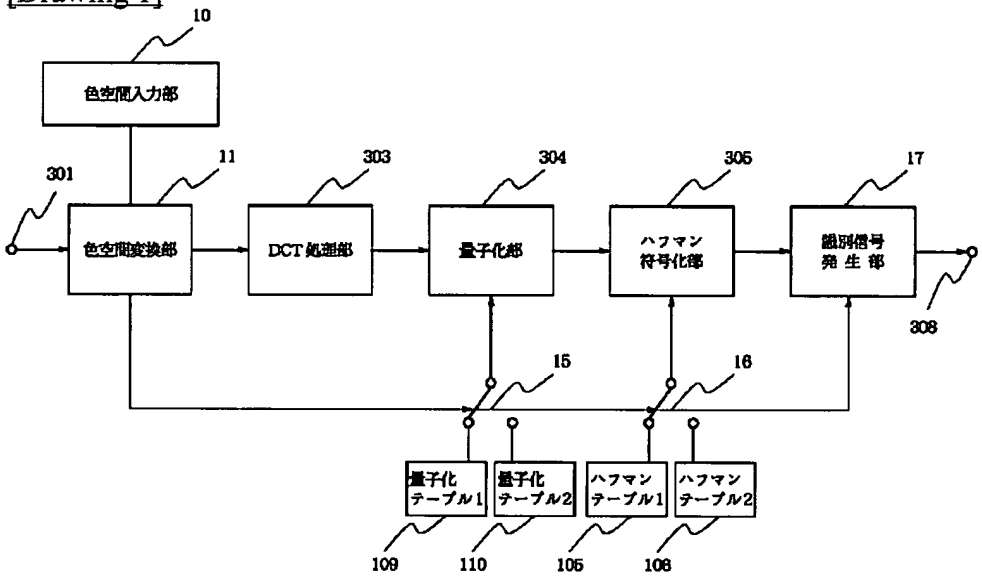
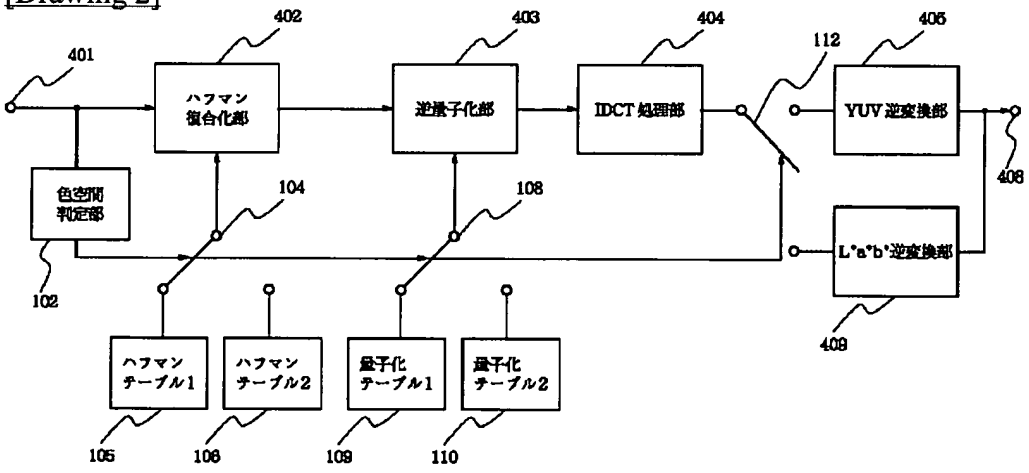
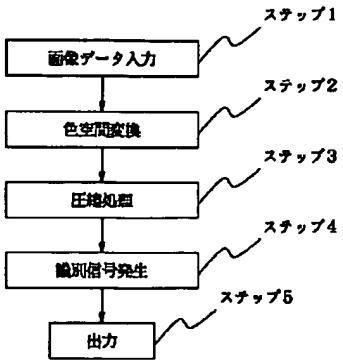
[Drawing 1]



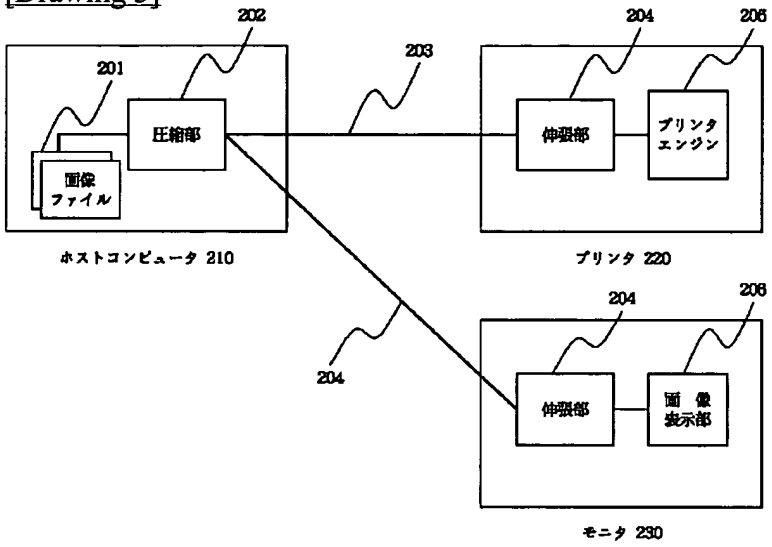

[Drawing 2]



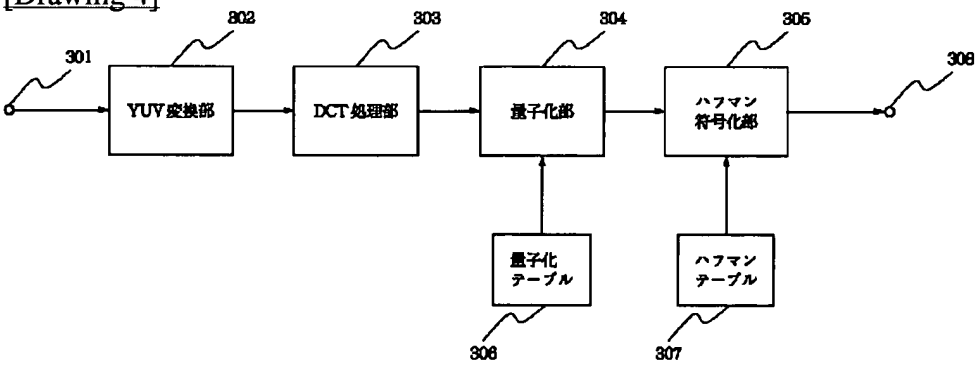

[Drawing 8]



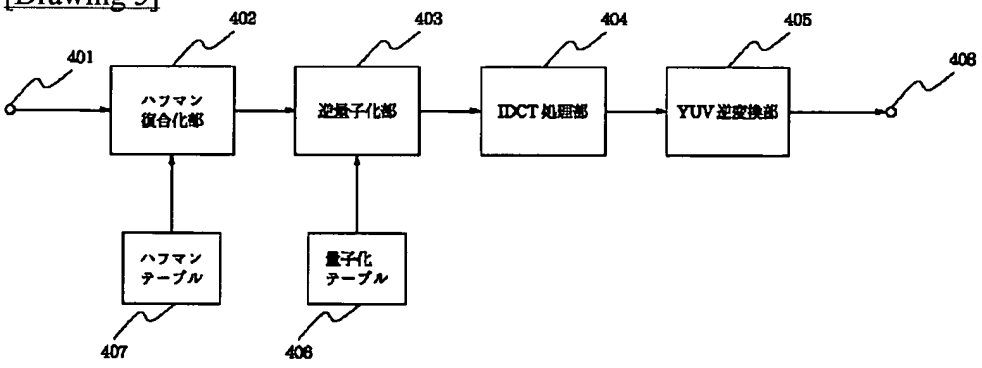

[Drawing 3]



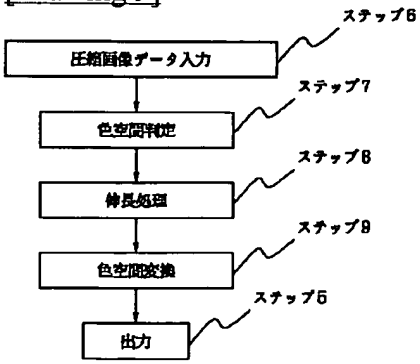

[Drawing 4]



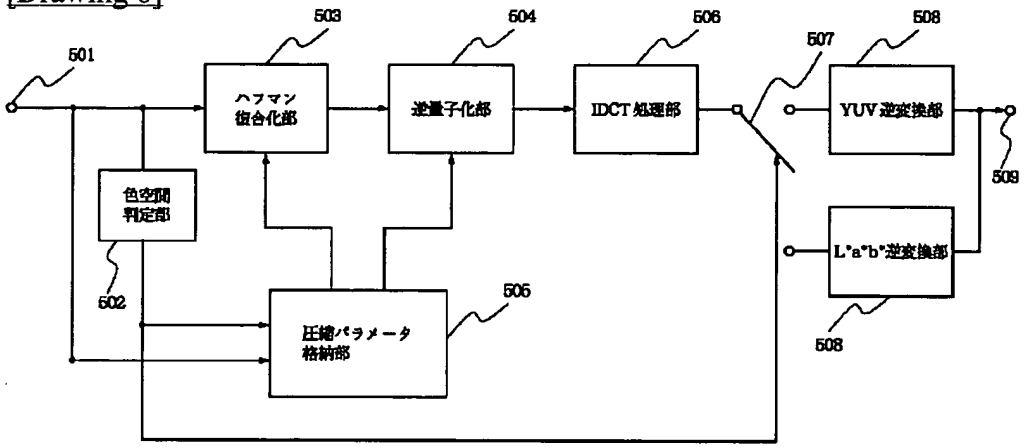

[Drawing 5]



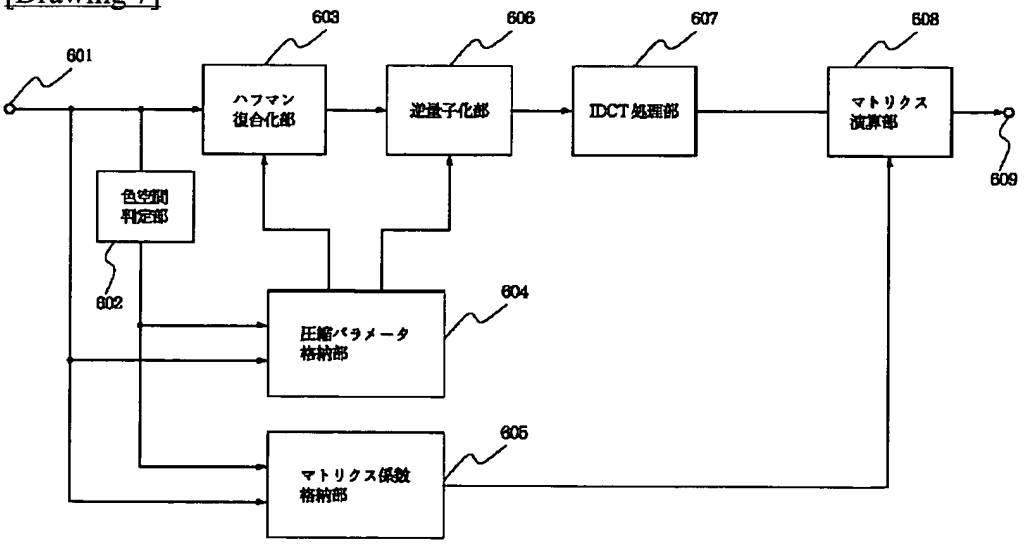
[Drawing 9]




[Drawing 6]




[Drawing 7]

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